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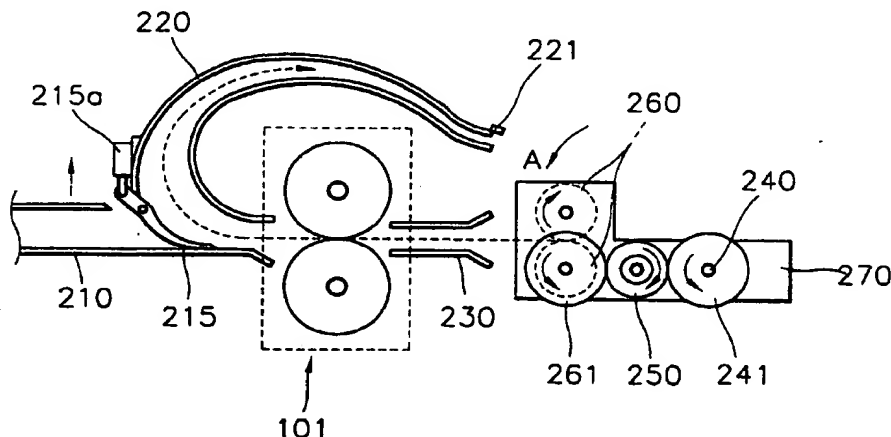
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(54) Paper reversing apparatus for a duplex printer

(57) An apparatus for reversing a paper sheet in a duplex printer for printing both sides of the sheet of paper, comprises a paper feeding guide (230) which is coupled to an inlet of a printing unit (101) and guides an unprinted sheet of paper toward said printing unit (101), a paper output guide (210) which is coupled to an outlet of said printing unit, and a reversing guide (220) branching from said paper output guide (210) that allows the

sides of the paper to be reversed and resupplies the reversed paper toward the inlet of said printing unit (101). A guiding means (215) selectively guides the leading edge of the paper coming from said printing unit (101) to proceed toward either said paper output guide (210) or said reversing guide (220). A resupplying means (260) resupplies a paper sheet having one side printed from said reversing guide (220) to said paper feeding guide (230) for printing on the other side.

FIG. 3a



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Description

[0001] The present invention relates to an apparatus for reversing a sheet of paper and supplying the reversed paper to a printing unit to print both sides of the paper.

[0002] In a typical duplex printer or a copying machine for double-sided printing, an apparatus for reversing a sheet of paper and supplying the reversed paper to a printing unit in sequence is provided in order to print an image on both sides of the supplied paper.

[0003] As shown in Figure 1, a conventional paper reversing apparatus includes forward-directional transfer rollers 40 which transfer a paper supplied from a paper cassette 20 or a manual feed tray 30 toward an output roller 60 via a printing unit 10, and reverse-directional transfer rollers 50 transferring the paper of the output roller 60 in the reverse direction, reversing the transferred paper, and again supplying the reversed paper to the printing unit 10.

[0004] In a printing process, a sheet of paper is supplied from the paper cassette 20 or the manual feed tray 30 and passes through the printing unit 10 printing an image on one side of the paper. After one side of the paper is completely printed, the paper is caught by the output roller 60. The output roller 60 reversely rotates to resupply the paper having one side thereof already printed through the reverse-directional transfer roller 50 to the printing unit 10 along a route indicated by the dotted lines in Figure 1. At this time, the paper proceeds in the reverse direction to enter the printing unit 10 while the upper and lower side surfaces are reversed. As a result, the image can be printed on the other side of the paper. After both sides of the paper have been completely printed, the paper is transferred by the forward-directional transfer roller 40 and is output by the output roller 60 to an output tray 70.

[0005] However, since the paper must be transferred forwardly and reversely along a long route inside a printer in the conventional paper reversing apparatus, the size of the printer is required to be large.

[0006] It is an aim of at least preferred embodiments of the present invention to provide an apparatus for reversing a sheet of paper of a printer for printing both sides of the paper having an improved structure in which the route for reversing the paper is shortened, thereby reducing the overall size of the printer.

[0007] According to one aspect of the present invention, there is provided an apparatus for reversing a paper in a printer for printing both sides of the paper which includes a paper feeding guide coupled to an inlet of a printing unit, for guiding an unprinted sheet of paper or a paper having one side printed to the printing unit, a paper output guide coupled to an outlet of the printing unit, for outputting a paper having both sides thereof printed out of a main body of the printer, a reversing guide branching from the paper output guide, for allowing reversing of the side of the paper having one side

printed which is output from the printing unit and resupplying the reversed paper toward the inlet of the printing unit, a means for selectively guiding the leading edge of the paper having one side printed through the printing unit to proceed toward either the paper output guide or the reversing guide, and a means for resupplying a paper having one side printed which is supplied from the reversing guide to the paper feeding guide and supplying the unprinted sheet of paper to the paper feeding guide.

[0008] According to a second aspect of the present invention, there is provided an apparatus for reversing a paper sheet, said apparatus for use in a duplex printer, said apparatus comprising: a paper feeding guide for guiding a sheet of paper to be printed toward an inlet of a printing unit; a paper output guide for guiding a printed sheet of paper away from an outlet of the printing unit; paper reversing means for reversing the sides of a piece of paper printed on only a first side and resupplying said piece of paper toward said printing unit to be printed on a second side; characterised in that said paper reversing means comprises: a reversing guide branching from said paper output guide for allowing reversing of said piece of paper when printed on said first side and resupplying the reversed sheet of paper toward the inlet of said printing unit; selective guide means for selectively guiding a leading edge of a printed sheet of paper either toward said paper output guide or said reversing guide; and paper resupplying means for resupplying a sheet of paper from said reversing guide to said paper feeding guide.

[0009] It is preferable in the present invention that the paper resupplying means includes a shaft being rotated by a driving source forwardly or reversely and having a first gear provided at one end thereof, a second gear coupled to one of the pickup rollers, a pair of brackets pivotally installed to support the pickup rollers and the shaft, an idle gear rotatably coupled to the bracket between the first and second gears to transfer a rotational force to the first and second gears, a friction member fixed to the bracket and friction-coupled to the idle gear, and stoppers for limiting the pivotal range of the bracket, wherein as the first gear of the shaft rotates forwardly or reversely, the bracket pivots due to a frictional force between the idle gear and the friction member to thereby be selectively aligned with the outlet of the reversing guide and the inlet of the paper feeding guide, and when the bracket is stopped by the stopper, the idle gear rotates by the rotational force greater than the frictional force so that the rotational force is transferred to the second gear.

[0010] Also, it is preferable in the present invention that the guiding means includes a pivot plate pivotally installed at the point where the paper output guide and the reversing guide branch away from each other for selectively blocking the passage of the paper output guide, and an actuator for pivoting the pivot plate.

[0011] For a better understanding of the invention,

and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1 is a sectional view schematically showing a route for a paper in a printer adopting a conventional paper reversing apparatus;

Figure 2 is a perspective view illustrating an apparatus for reversing a sheet of a paper according to an embodiment of the present invention; and

Figures 3A through 3C are views for explaining the operation of the paper reversing apparatus shown in Figure 2, in which Figure 3A shows a sheet of a paper being supplied to a printing unit; Figure 3B shows the paper having one side printed returning to an inlet of the printing unit by a reversing guide; and Figure 3C shows the paper having one side printed being resupplied to the printing unit.

[0012] As shown in Figure 2, a printing unit 101 is installed inside a main body of a printer (not shown), and a paper supply guide 230 and a paper output guide 210 are installed at an inlet and an outlet of the printing unit 101, respectively. The paper supply guide 230 guides the entry of paper to the printing unit 101 and the paper output guide 210 guides the paper having been printed to be output from the printer.

[0013] Also, a reversing guide 220 for reversing the paper passing through the printing unit 101 and supplying the same to the inlet of the printing unit 101 is formed adjacent to and branching away from the entrance of the paper output guide 210. A means for selectively guiding the paper having passed through the printing unit 101 to proceed along the paper output guide 210 or the reversing guide 220 is installed at a point where the paper output guide 210 and the reversing guide 220 branch away from each other.

[0014] The guiding means comprises a pivot plate 215 which is pivotally installed at the branching point of the paper output guide 210 and the reversing guide 220 and selectively guides the leading edge of the paper having passed through the printing unit 101 to proceed toward either the paper output guide 210 or the reversing guide 220, and an actuator for actuating the pivot plate 215 such as a solenoid 215a.

[0015] The preferred paper reversing apparatus comprises a paper resupplying means for supplying a paper sheet from the paper cassette 20 or the manual feed tray 30 (see Figure 1) to the paper supply guide 230 and resupplying the paper supplied through the reversing guide 220 to the paper supply guide 230.

[0016] The paper resupplying means comprises a pair of pickup rollers 260 which are installed at an inlet of the printing unit 101 and supply the paper to the paper supply guide 230. The pickup rollers 260 are rotated by

being driven by a motor 242 in a forward or the reverse direction. That is, the motor 242 is coupled with a shaft 240 having a first gear 241 formed at one end thereof. A second gear 261 is provided at one end of the shaft of one of the pickup rollers 260. Thus, the rotational force of the motor 242 is transferred to the pickup rollers 260 via the first gear 241, an idle gear 250 and the second gear 261. The shaft 240 and the pickup rollers 260 are rotatably supported by a pair of brackets 270.

[0017] The idle gear 250 transfers the rotational force of the first gear 241 to the second gear 261 and rotates in contact with a friction member 253 which is coupled to one side of the bracket 270. The idle gear 250 is pressed against the friction member 253 by a spring 252. The frictional contact between the idle gear 250 and the friction member 253 is intended to selectively pivot the paper resupplying means toward either the reversing guide 220 or the paper output guide 230, as will be described later. Reference numeral 110 denotes a partition wall inside the printer main body; reference numerals 111 and 112 respectively denote first and second stoppers to limit the pivotal range of the bracket 270 such that the pickup rollers 260 can be aligned with the paper supply guide 230 or the reversing guide 220; and reference numeral 221 denotes a sensor for detecting whether paper is being passed through or not.

[0018] The operation of the paper reversing apparatus having the above structure will now be described.

[0019] When a sheet of a paper to be printed is supplied, as shown in Figure 3A, the shaft 240 is rotated by the motor 242 (see Figure 2) counterclockwise. Accordingly, the idle gear 250 interlocked with the first gear 241 receives a rotational force. Here, since the idle gear 250 contacts the friction member 253, the idle gear 250 does not rotate on its axis but revolve counterclockwise around the first gear 241 along the outer circumference of the first gear 241. Accordingly, the bracket 270 itself rotates around the shaft 240 as indicated by arrow "A". The brackets 270 further rotate until stopped by the first stopper 111 (see Figure 2).

[0020] When the brackets 270 are stopped by the first stopper 111, the pickup rollers 260 are aligned with the paper supply guide 230 so that a sheet of paper (not shown) can be supplied to the paper supply guide 230. Concurrently, the idle gear 250 begins to rotate by receiving a rotational force from the first gear 241 which is greater than the frictional force between the idle gear 250 and the friction member 253. Thus, the rotational force of the first gear 241 is transferred to the pickup rollers 260 via the idle gear 250 and the second gear 261 so that the pickup rollers 260 rotate. Therefore, the paper supplied from the paper cassette 20 or the manual feed tray 30 (see Figure 1) passes between the pickup rollers 260 and through the paper supply guide 230, and an image is printed on one side of the paper by the printing unit 101.

[0021] Here, the pivot plate 215 blocks the paper output guide 210 by being driven by the solenoid 215a as

shown in Figure 3A. Accordingly, the paper having one side printed in the printing unit 101 is guided toward the reversing guide 220 by the pivot plate 215 in a path as indicated by the dotted arrow in Figure 3A.

[0022] When the tailing end of the paper completely passes through the pickup rollers 260, the shaft 260 is rotated in the reverse direction, i.e., clockwise, as shown in Figure 3B. Accordingly, the rotational force is transferred to the idle gear 250 interlocked with the first gear 241. At this time, the idle gear 250 does not rotate on its axis but revolves clockwise around the first gear 241 along the outer circumference of the first gear 241 due to the friction between the idle gear 250 and the friction member 253. Thus, the brackets 270 rotate around the shaft 240 as indicated by an arrow "B" until stopped by the second stopper 112 (see Figure 2).

[0023] When the brackets 270 stop by contacting the second stopper 112, the pickup roller 260 is aligned with the reversing guide 220 so that the pickup roller 260 can be supplied with the paper from the reversing guide 220. Concurrently, the idle gear 250 begins to rotate by receiving a rotational force from the first gear 241 which is greater than the frictional force between the idle gear 250 and the friction member 253. Thus, the rotational force of the first gear 241 is transferred to the pickup rollers 260 via the idle gear 250 and the second gear 261 so that the pickup rollers 260 rotate. As the pickup rollers 260 rotate, the paper having been passed through the reversing guide 220 passes between the pickup rollers 250 as indicated by dotted arrow shown in Figure 3B. Here, the sheet of paper is reversed as it passing through the reversing guide 220. For instance, the position of the rear surface of the paper which is printed in the printing unit 101 is changed to be the front surface of the paper after passing through the reversing guide 220.

[0024] The paper output from the reversing guide 220 is detected by the sensor 221 installed at an outlet of the reversing guide 220. Alternatively, the output of the paper can be recognized by counting the number of rotations of a motor (not shown) which drives the printing unit 101.

[0025] Then, when the paper is detected by the sensor 221 to be completely output, the shaft 240 is rotated counterclockwise as shown in Figure 3C. As previously described, the brackets 270 pivot in a direction indicated by the arrow "A" so that the pickup rollers 260 and the paper feeding guide 230 are aligned with each other. The pickup rollers 260 resupply the paper to the paper feeding guide 230. Thus, the paper having the positions of the front and rear sides being changed is supplied to the printing unit 101, thereby enabling printing on the other side of the paper.

[0026] Here, the pivot plate 215 opens the passage of the paper output guide 210 by being rotated by a driving force of the solenoid 215a. Then, the paper whose both sides are completely printed in the printing unit 101 is output from the printer main body through the paper

output guide 210.

[0027] Therefore, the apparatus reverses the sides of a paper sheet by switching the rotational direction of the pickup rollers 260 between the forward and reverse directions thereby pivotally moving the pickup rollers 260 to be selectively aligned with either the paper output guide 220 or the paper feeding guide 230, and the paper passed through the printing unit 101 can be resupplied in a reversed state.

[0028] As described above, the route for reversing the sides of the paper in the printer can be shortened so that the overall size of the printer can be reduced.

[0029] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0030] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0031] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0032] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. An apparatus for reversing a paper sheet, said apparatus for use in a printer for printing both sides of the paper, said apparatus comprising:

a paper feeding guide (230) coupled to an inlet of a printing unit, said paper feeding guide (230) for guiding an unprinted sheet of paper or a paper sheet having one side printed to said printing unit;

a paper output guide (210) coupled to an outlet of said printing unit, for outputting a paper sheet having both sides thereof printed out of a main body of a printer;

a reversing guide (220) branching from said pa-

per output guide (210), for allowing reversing of the side of the paper sheet having one side printed which is output from said printing unit and resupplying the reversed paper toward the inlet of said printing unit;

a means (215) for selectively guiding the leading edge of the paper having one side printed through said printing unit to proceed toward either said paper output guide (210) or said reversing guide (220); and

a means (270) for resupplying a paper having one side printed which is supplied from said reversing guide to said paper feeding guide and supplying the unprinted sheet of paper to said paper feeding guide.

2. An apparatus for reversing a paper sheet, said apparatus for use in a duplex printer, said apparatus comprising:

a paper feeding guide (230) for guiding a sheet of paper to be printed toward an inlet of a printing unit;

a paper output guide (210) for guiding a printed sheet of paper away from an outlet of the printing unit;

paper reversing means for reversing the sides of a piece of paper printed on only a first side and resupplying said piece of paper toward said printing unit to be printed on a second side;

characterised in that said paper reversing means comprises:

a reversing guide (220) branching from said paper output guide for allowing reversing of said piece of paper when printed on said first side and resupplying the reversed sheet of paper toward the inlet of said printing unit;

selective guide means (215) for selectively guiding a leading edge of a printed sheet of paper either toward said paper output guide or said reversing guide; and paper resupplying means for resupplying a sheet paper from said reversing guide to said paper feeding guide.

3. The apparatus as claimed in claim 1 or 2, wherein said paper resupplying means (270) comprises a pair of pickup rollers (260) being pivotable to be selectively aligned with either an outlet of said reversing guide (220) or an inlet of said paper feeding guide (230), for supplying an unprinted paper sheet or a paper sheet having one side printed to said pa-

per feeding guide (230) by selectively rotating in a forward or reverse direction.

4. The apparatus as claimed in claim 3, wherein said paper resupplying means (270) comprises:

a shaft (240) for rotation by a driving source forwardly or reversely and having a first gear (241) provided at one end thereof;

a second gear (261) coupled to one of said pickup rollers (260);

a pair of brackets (270) pivotally installed to support said pickup rollers (260) and said shaft (240);

an idle gear (250) rotatably coupled to said bracket between said first and second gears to transfer a rotational force between said first and second gears;

a friction member (253) fixed to one of said brackets (270) and friction-coupled to said idle gear (250); and

stoppers (111, 112) for limiting the pivotal range of said brackets (270), wherein as said first gear (241) of said shaft (240) rotates forwardly or reversely, said brackets (270) pivot due to a frictional force between said idle gear (250) and said friction member (253) to thereby be selectively aligned with the outlet of said reversing guide (220) or the inlet of said paper feeding guide (230), and when said brackets are stopped by one of said stoppers, said idle gear (250) rotates by a rotational force greater than the frictional force so that the rotational force is transferred to said second gear (261).

5. The apparatus as claimed in any preceding claim, wherein said selective guide means (215) comprises:

a pivot plate (215) pivotally installed at the point where said paper output guide and said reversing guide branch away from each other for selectively blocking the passage of said paper output guide; and

an actuator (215a) for pivoting said pivot plate.

6. The apparatus as claimed in any preceding claim, wherein a sensor (221) for detecting whether the paper being output is further provided at the outlet of said reversing guide (220).

7. A printer comprising a paper reversing apparatus

as claimed in any preceding claim.

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FIG. 1(PRIOR ART)

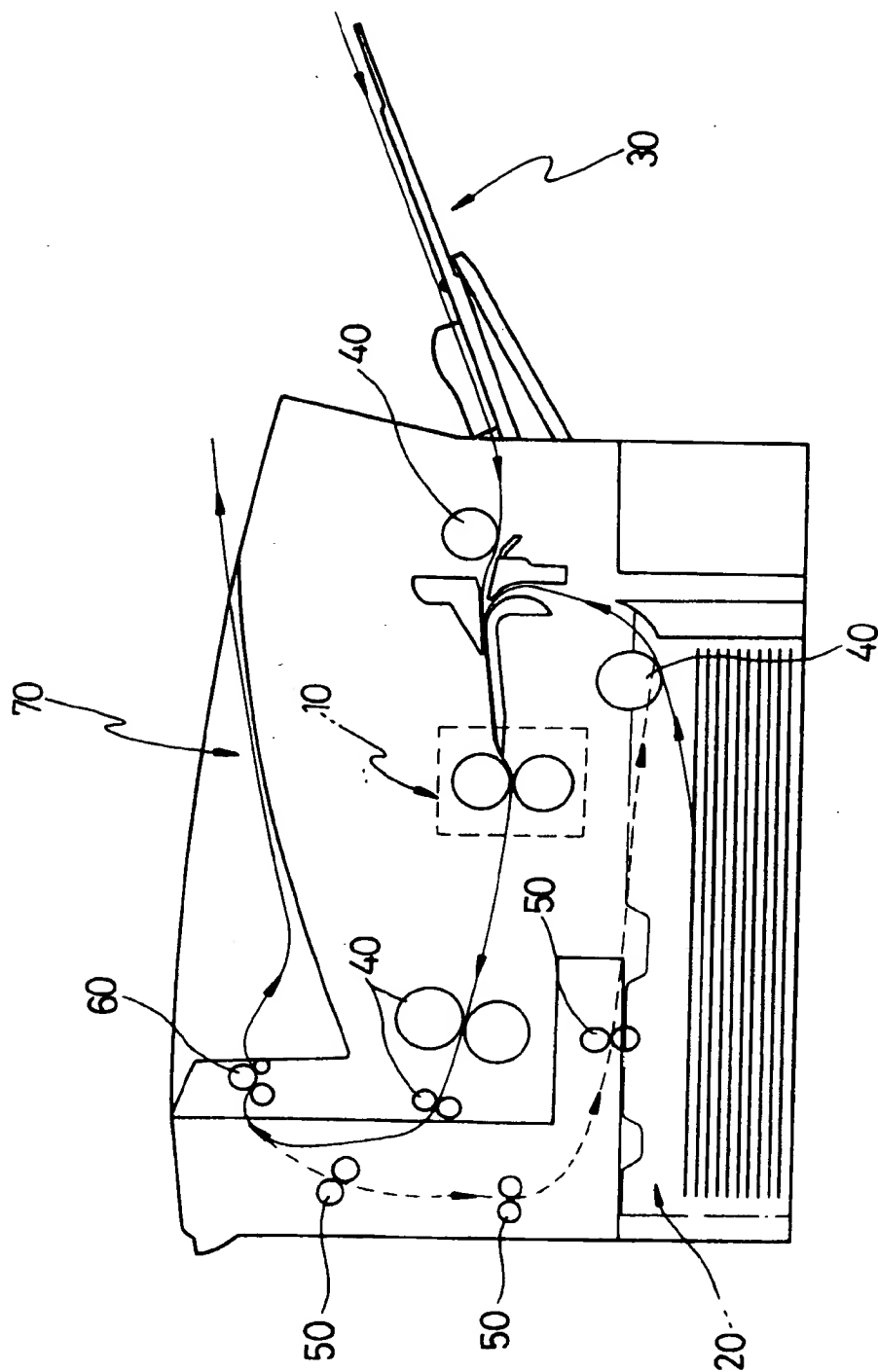


FIG. 2

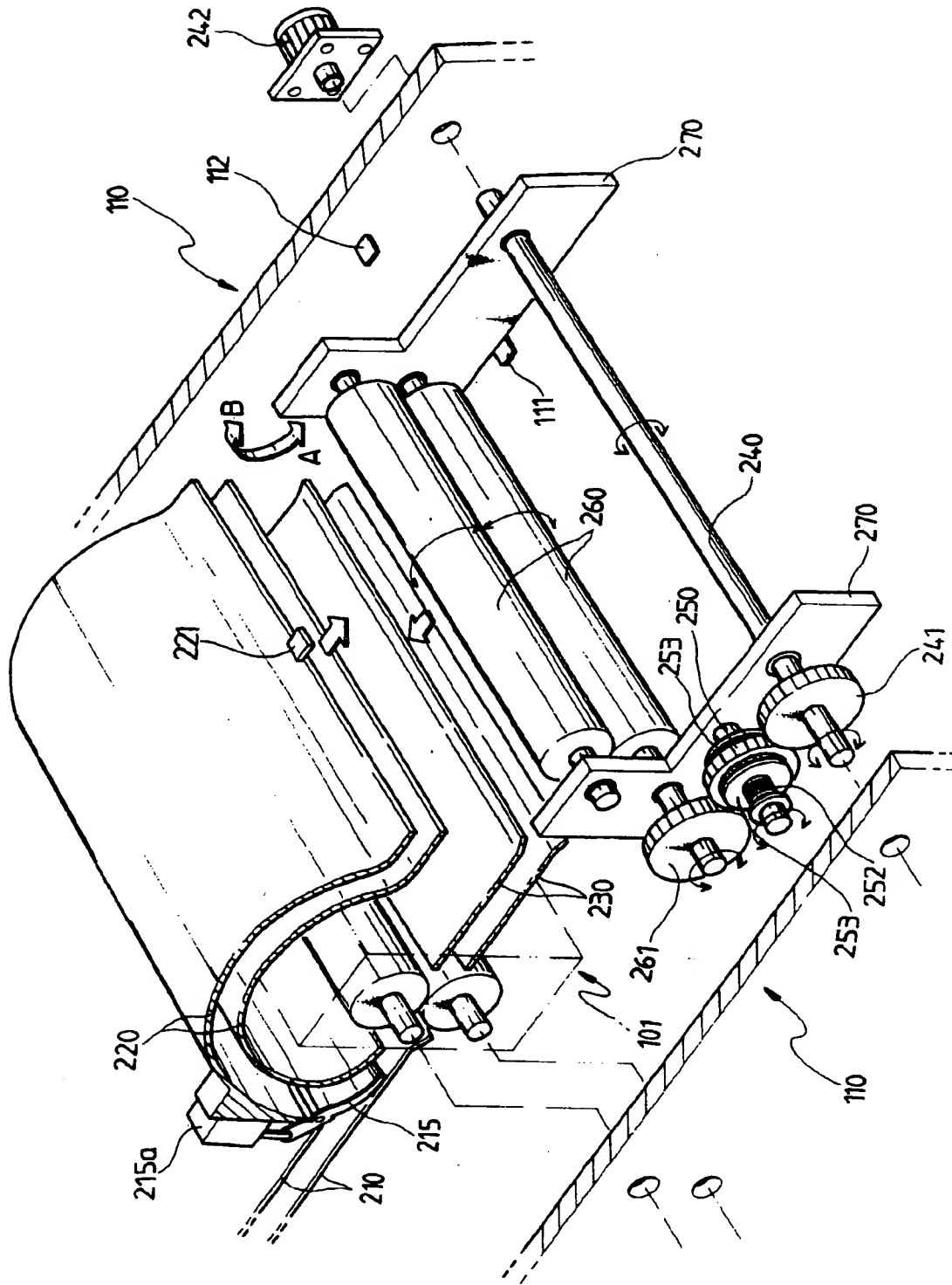


FIG. 3a

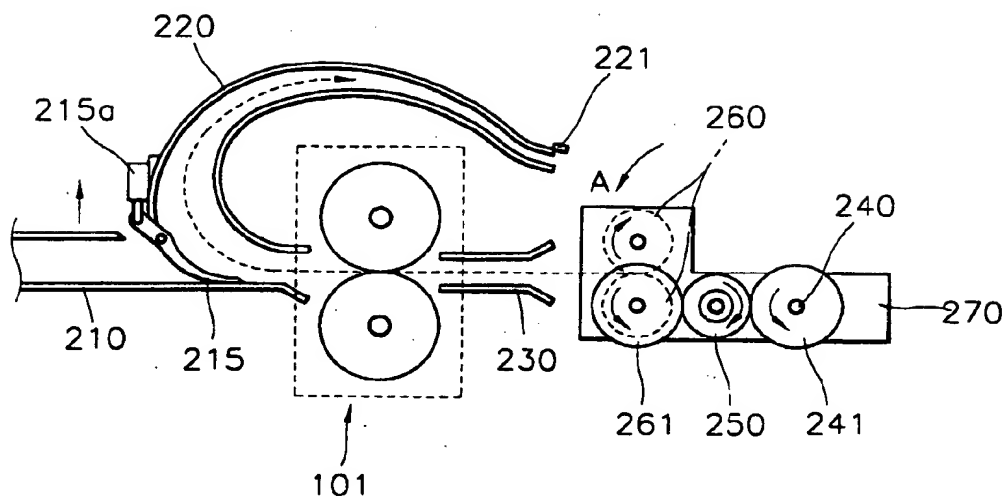


FIG. 3b

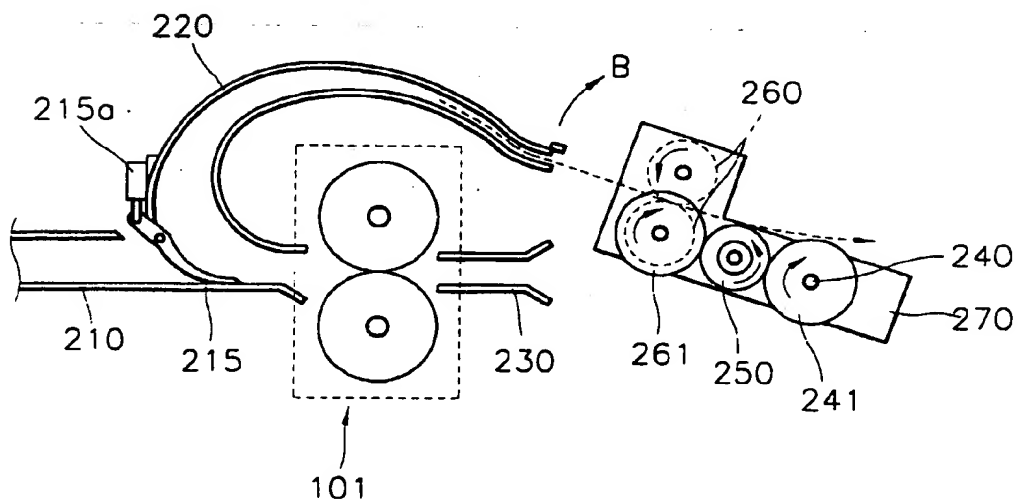
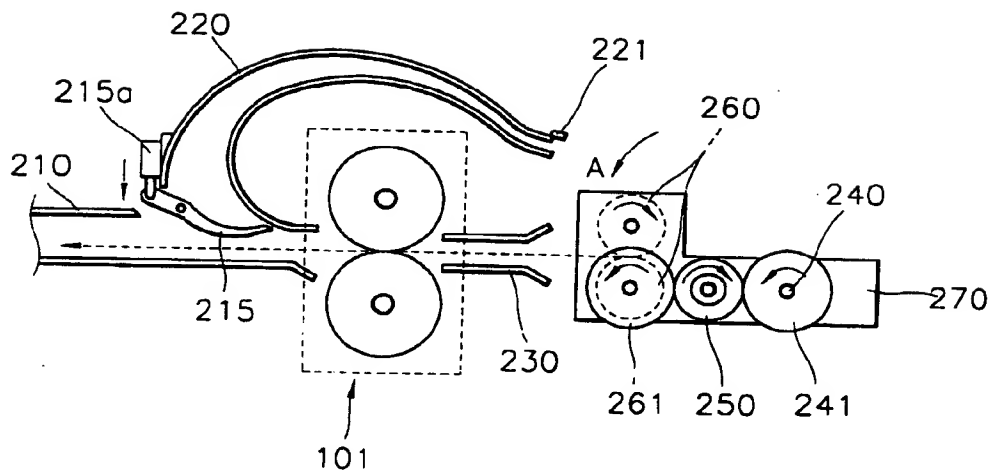


FIG. 3c





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 1739

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.8)
X	US 5 415 391 A (WONG CHEE-CHIU J ET AL) 16 May 1995 * column 2, line 21 - column 3, line 25; figures *	1,2,5-7	B65H15/00
X	----- PATENT ABSTRACTS OF JAPAN vol. 015, no. 047 (P-1162), 5 February 1991 & JP 02 280172 A (RICOH CO LTD), 16 November 1990 * abstract *	1,2,5,7	
X	----- PATENT ABSTRACTS OF JAPAN vol. 018, no. 592 (M-1702), 11 November 1994 & JP 06 219651 A (RICOH CO LTD), 9 August 1994 * abstract *	1,2,5,7	
A	----- PATENT ABSTRACTS OF JAPAN vol. 010, no. 040 (M-454), 18 February 1986 & JP 60 191943 A (RICOH KK), 30 September 1985 * abstract *	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.8) B65H
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 6 November 1998	Examiner David, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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